

branches and a single immature fruit, but we were already convinced then that the material represented a new species. It was not until 2005, however, when a more concentrated collecting effort took place in the dry forest along Río Tuichi that more and fully flowering material was collected by Araujo-Murakami.

Diagnostic characters and possible relationships. *Passiflora madidiana* is difficult to key to series within the subgenus *Passiflora* L. (named subgenus *Granadilla* (Mill.) Rchb.) in the most recent monograph treatment of Passifloraceae (Killip, 1938). The species has mostly entire leaves, but 2- and 3-lobed leaves are found, which makes it difficult to fit it within series *Simplicifoliae* sensu Killip (1938), characterized by entire leaves. In the series with 3-lobed leaves, *Lobatae* sensu Killip (1938) and *Menispermifoliae* Killip ex Cervi, it stands out by either being densely puberulent (if placed in *Lobatae*) or not having the dense hirsute pubescence of *Menispermifoliae*.

Species of series *Lobatae* are glabrous except for *Passiflora gardneri* Mast., and *P. madidiana* clearly differs from that species by having mostly entire semicoriaceous leaves versus 3-lobed membranous leaves. The stipules of *P. madidiana* are five times longer and two times wider than in *P. gardneri*, and the leaves are only half as wide. *Passiflora madidiana* has only three corona series versus four to five in *P. gardneri*, but the outer corona is twice as long. The two species do not appear to be closely related.

In series *Simplicifoliae*, *Passiflora madidiana* keys to *P. actinia* Hook., *P. jilekii* Wawra, or *P. mapiriensis* Harms in Killip (1938). *Passiflora mapiriensis* is found only about 115 km south of the Tuichi drainage, but differs from *P. madidiana* by being a glabrous species with a pubescent ovary; smaller lanceolate stipules that are early deciduous; bracts that are much larger and lanceolate, cuneate, and acuminate; and a corona of four or five series and larger for all series, but with the awn of the sepal smaller. The Brazilian species *P. actinia* and *P. jilekii* differ from *P. madidiana* by being glabrous. *Passiflora madidiana* further differs from *P. actinia* in its narrower leaves, obtuse bracts that are about half the size, much smaller flowers, the corona in fewer series, and the markedly different coloration of the corona; it can be distinguished from *P. jilekii* by its smaller and more membranous leaves, shorter peduncles, and much longer awn.

In series *Menispermifoliae*, *Passiflora madidiana* will key to *P. crassifolia* Killip, a species from Junín, Peru, found at similar elevations but in humid vegetation (T. Boza, pers. comm.). This species is very similar to *P. madidiana* in general appearance, and it is the only member of the series with entire

leaves; however, it differs from *P. madidiana* in a number of characteristics, particularly in being puberulent versus densely villous, having stipules that are twice as large and bracts that differ in pubescence and shape, and most noticeably in the outer corona, which is almost 2 cm long in *P. madidiana* versus only 7 mm long in *P. crassifolia*.

The discovery of *Passiflora madidiana* and the postulated relationships with *P. crassifolia*, *P. jilekii*, *P. actinia*, and *P. mapiriensis* suggest that both series *Simplicifoliae* and series *Menispermifoliae* are in need of taxonomic rearrangement. The new species is placed in section *Granadillastrum* Triana & Planch. (Feuillet & MacDougal, 2003), which includes all the series and species discussed above.

Paratypes. BOLIVIA. **La Paz:** Franz Tamayo, Parque Nac. y Área Natural de Manejo Integrado Madidi, Sect. Pintata próx. al Río Tuichi entre Virgen del Rosario y Suyo Suyo, 14°26'34"S, 68.34'47"W, 4 Dec. 2005 (fl., fr.), A. Araujo-Murakami, A. Fernandez & S. Paredes, E. Cuevas & C. Cuevas 2574 (LPB); Sect. Pintata próx. a la comun. de Sipia entre Virgen del Rosario y Suyo Suyo, 14°28'06"S, 68°32'19.7"W, 19 Feb. 2003 (fr.), L. Cayola, A. Araujo, H. Cabrera, M. Calzadilla, F. Canqui, C. Maldonado, N. Paniagua, R. Alvarez, A. Alvarez & M. Alvarez 3 (LPB, MO); Sect. Pintata próx. al Río Tuichi entre Virgen del Rosario y Suyo-suyo, 14°26'34"S, 68°34'47"W, 4 Dec. 2005 (fr.), A. Araujo-Murakami, A. Poma, P. Garagorri, S. Paredes & E. Cuevas 2420 (LPB).

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A New Endemic Species in *Trichophorum* (Cyperaceae) from South Korea

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ABSTRACT. *Trichophorum dioicum* J. Jung & H. K. Choi (Cyperaceae) was observed growing on limestone cliffs within a government-protected area, from Gangwon-do, South Korea. Morphological characteristics of the new species, such as the reduced leaf blade and the single spikelet at the culm terminus, correspond to *Trichophorum* Pers., a sister genus among *Scirpus* L. s.l. Previous molecular analysis of the chloroplast *rbcL* gene and ITS region of nuclear ribosomal DNA supported the identity of this new endemic species as a member of *Trichophorum*.

Key words: Cyperaceae, IUCN Red List, South Korea, *Trichophorum*.

Recently, a new endemic sedge, identified as “*Scirpus dioicus*” was described in South Korea (Lee & Oh, 2006b: 614). They compared this species with *S. cespitosus* L., which is very similar in morphology, and indicated the dioecism of the new taxon. However, the type was not specified and the name was invalidly published (cf. Art. 37.7, McNeill et al., 2006). Lee and Oh (2006b) maintained a broad concept of *Scirpus* L., which included numerous taxa such as *Trichophorum* Pers., *Bolboschoenus* (Asch.) Palla, and *Schoenoplectus* (Rchb.) Palla. Later, in the same year, the same authors reported a new genus, as “*Neoscirpus*,” based on the characteristics of their dioecious sedge (Lee & Oh, 2006a: 25). However, the type was not specified and the generic name was established upon the invalid name from 2006.

Scirpus s.l. has been recognized as a polyphyletic group and is generally accepted as a taxonomic complex of several genera (Koyama, 1978; Bruhl, 1995; Goetghebeur, 1998). One segregated genus, *Trichophorum*, has discriminating characteristics such as leaves with a ligule and a reduced blade, small primary bracts, and an inflorescence with a single or few spikelets and bisexual flowers (Goetghebeur, 1998). Moreover, a molecular phylogenetic study based on analyses of the chloroplast *rbcL* gene and *trnL-F* noncoding region supported *Trichophorum* as a genus independent from *Scirpus* s.l. (Muasya et al., 2009).

The evidence supporting the establishment of a separate genus (Lee & Oh, 2006a)—habitat, flowering

season, and achene shape in *Scirpus* s.l.—are variable characteristics and so are inconclusive. Dioecism is not abundant, but is generally observed in angiosperms (Dellaporta & Calderon-Urrea, 1993) and has been reported in several genera of Cyperaceae, such as *Carex* L., *Scleria* P. J. Bergius, and *Everardia* Ridl. (Bruhl, 1995; Goetghebeur, 1998). Moreover, the entity described as dioecious by Lee and Oh (2006a, b) is actually polygamous. The bisexual flowers and achenes of this species are observed in male plants (partially bisexual), while female plants present only female flowers. Morphologically, this taxon shares synapomorphy with *Trichophorum*. In addition to these morphological similarities, its chloroplast *rbcL* gene and nuclear ITS DNA sequences display greater similarity to the type of *Trichophorum* (*T. alpinum* (L.) Pers.) than to other species of *Scirpus* s.l. (unpublished GenBank accession numbers FJ797640 and FJ797641). We suggest that the new taxon does not belong to *Scirpus* and that its phylogenetic identity lies within *Trichophorum*, which is caespitose and rhizomatous, and has ligulate leaves, a reduced leaf blade, and a single spikelet at the culm terminus.

Trichophorum dioicum J. Jung & H. K. Choi, sp. nov. *Scirpus dioicus* Y. N. Lee & Y. C. Oh, New Fl. Korea 2: 614, [15 Sep.] 2006, nom. inval. *Neoscirpus dioicus* (Y. N. Lee & Y. C. Oh) Y. N. Lee & Y. C. Oh, Bull. Korea Pl. Res. 6: 25, [20 Dec.] 2006, nom. inval. TYPE: Korea [South Korea]. Gangwon-do: Jeongseon-gun, 17 Apr. 2008 (♀ fl.), J. Jung 804020 (holotype, AJOU; isotype, AJOU). Figure 1.

Haec species *Trichophoro cespitoso* (L.) Hartm. similis, sed ab eo floribus nonnullis bisexualibus (planta polygama) atque achenio elliptico, ab omnibus congeneris rhizomate repente, culmo trigono atque setis hypogynis elongatis distinguitur.

Perennial, polygamous, shortly rhizomatous herb; roots fibrous; culms densely tufted, erect, glabrous, striate, 5–20 cm, 0.3–0.8 mm diam., elongating to 40 cm at maturity. Leaves reduced, ligulate, triangular to lanceolate, 1–1.5 cm; sheaths 2 or 3 per culm, aristate, membranous, awns 2–10 mm. Inflorescence of a single spikelet at culm terminus, composed of

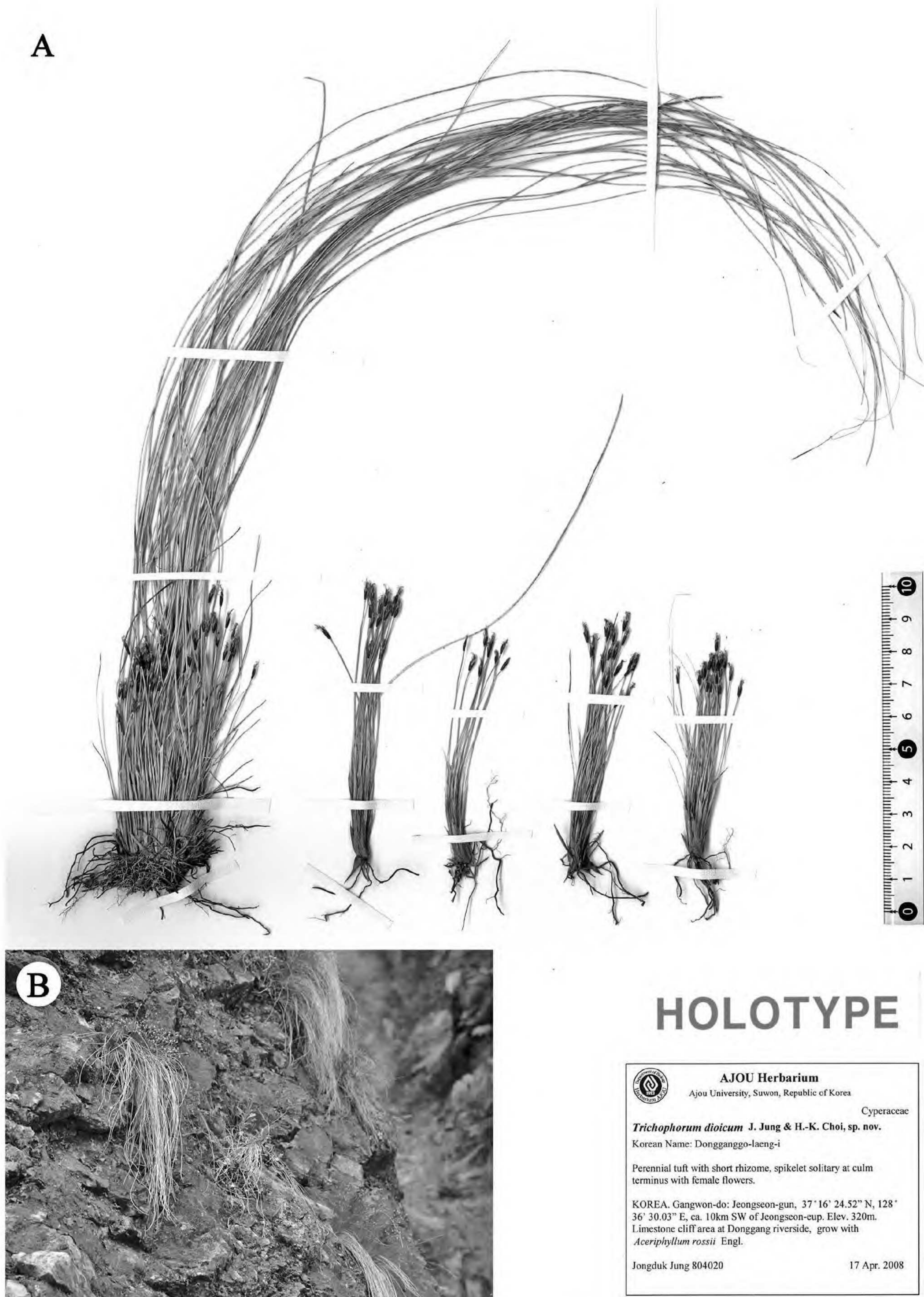


Figure 1. *Trichophorum dioicum* J. Jung & H. K. Choi. —A. The type J. Jung 804020 (AJOU). —B. Habitat at the type locality (photo taken by J. Jung, 17 April 2008).

unisexual and perfect flowers, elliptic, $3.5\text{--}6.5 \times 0.8\text{--}2$ mm, exceeded by stigmas and anthers; spikelet with 3 to 5 florets; floral scales brown, cleft, with short awn, deciduous at maturity, $3\text{--}5.5 \times 1.4\text{--}3.2$ mm; stigmas

trifid, 2–5 mm; stamens 3 in staminate florets and rudimentary in pistillate florets; anthers 2–3.5 mm, hypogynous bristles 6, filiform, 3–5.5 mm. Achenes brown, narrowly elliptic, trigonous, $2\text{--}3 \times 0.7\text{--}0.9$ mm.